April 1967

EMO

Operation of Public Utilities

Impact of Disaster on Community Life

Multiple Fires from a Nuclear Explosion

A New Spirit in Disarmament Talks

Nuclear Attack: The Economic Challenge and Response

Some Public Views on Civil Defense Programs

CANADA EMERGENCY MEASURES ORGANIZATION

EMO NATIONAL DIGEST

Published by

Canada Emergency Measures Organization, Ottawa, Ont.

Vol. 7 • No. 2

April, 1967

Contents

Senior Officers' Briefing

Operation of Public Utilities—
Post Attack Problems and Procedures 1

Impact of Disaster on Community Life 10

Multiple Fires from a Nuclear Explosion 14

A New Spirit in Disarmament Talks 15

Nuclear Attack: The Economic Challenge and Response 18

Some Public Views on Civil Defense Programs 21

The EMO NATIONAL DIGEST publishes six editions annually to provide current information on a broad range of subjects dealing with civil emergency planning. The magazine is published in English and French and may be obtained by writing to the Canada Emergency Measures Organization, Centennial Tower, 400 Laurier Ave. West, Ottawa 4, Ont.

In addition to publishing articles which reflect Canadian Government policy the Digest may also publish articles by private individuals on subjects of current interest to the emergency measures programme. The views of these contributors are not necessarily subscribed to by the Federal Government.

Director General: C. R. PATTERSON *Editor:* B. L. PERRIER

ROGER DUHAMEL, F.R.S.C.
QUEEN'S PRINTER AND CONTROLLER OF STATIONERY
OTTAWA, 1967

OPERATION OF PUBLIC UTILITIES
POST-ATTACK PROBLEMS AND PROCEDURES

by

J. W. Bailey,
Chief, Emergency Planning Division,
Department of Public Works,
Ottawa

This paper was presented at the 1966 Meeting of NATO Civil Defence Committee Scientific Working Party.

In conjunction with the Provincial and Municipal Governments, The Department of Public Works of Canada is engaged in the planning of a wartime organization for the post-attack control of all engineering and construction resources. It is certain that public utilities systems would have major demands for such resources after a nuclear strike; and it is obvious that they would stand high on the priority lists.

This paper reviews some of the problems which, after a nuclear attack on North America, might face the operators of utilities services such as water, sewage, gas and electricity. Current states of preparedness are examined briefly; recommendations are made with a view to reducing the vulnerability of our public utility plants and distribution systems; and post-attack operating procedures are discussed.

Canada's Public Utilities in the Nuclear Age

Civilization as we know it in the world today would not have been possible without the development of the major public utilities; electricity, water supply, sewage disposal, and fuel distribution. Engineering miracles in these fields have made it possible for millions of people to live and work together, concentrated in large cities in comfort and safety. Great industries, with tremendous demands for power, water and fuel, thrive in our midst, provide us with a high standard of living that is without precedent in history, and contribute in large measure to the prosperity of nations. Life in rural areas has been revolutionized by engineering projects such as electrification, irrigation, and fuel distribution networks.

All this is taken for granted by the population of Canada. Our public utilities are generally well maintained, and virtually trouble-free. Infrequent breakdowns are dealt with expeditiously, and even major interruptions of service occasioned by peacetime disaster have been rectified promptly, without undue danger to the health or economy of the region affected.

It is an unfortunate fact of life that the public utilities of Canada are highly vulnerable to nuclear attack. Under any conceivable set of circumstances in a major nuclear war, the number of Canadian targets would be small. Nevertheless, even without a single strike on Canadian soil, the lives of the majority of our populace could be endangered by radioactive fallout from surface bursts in the United States. It is true that most people in the paths of radioactive clouds could be saved from excessive exposure to gamma radiation by taking refuge in shelter areas designated by civil defence planning staffs. It is equally true that the same people could die of many other causes in the absence of potable water, food, heat, and adequate sanitary facilities. The prompt restoration of public utilities is therefore of paramount importance to save the survivors of an attack. In the longer term, national recovery itself becomes feasible only after the power comes back on, and water, gas and sewage services function once again.

Those charged with the operation of utilities systems are accustomed to troubles, emergencies, and even disasters. They bear a heavy responsibility to the general public, and they are well trained and organized to discharge this responsibility quickly and effectively. This is particularly true in Canada, where, for example, the cruel winter season makes prolonged interruption of power and heat highly intolerable. Utilities breakdowns of disaster proportion do occur from time to time. In such cases, help flows rapidly into the stricken area from outside, in the form of trained personnel and technical supplies. Such mutual assistance may be based on written agreements, but is often provided on the spur of the moment, with the paperwork being done at a later date. However, in the aftermath of a nuclear attack, this outside assistance may not be forthcoming, as the supporting forces will probably be pinned down by fallout, and will no doubt find themselves heavily committed in their own areas of responsibility.

The reliability standards which our utilities operators have achieved are as high as any in the world. It would be impossible to maintain them in the post-nuclear attack period, for the simple reason that the effects of nuclear explosions were not considered in the design and operating criteria. This shortcoming is not easy to rectify, but there is much that can be done.

The purpose of this paper is to briefly review some of the problems with which Canadian utilities operators might be confronted in the event of nuclear attack on North America; to formulate recommendations in connection with emergency planning for such an eventuality; and to suggest post-attack procedures designed to restore services with minimum delay.

To achieve this aim, the four major utilities under discussion will be studied separately, although they are in fact inseparable. The weapons effects to be considered are blast, thermal radiation, and fallout. Emphasis will be placed on the latter, as the problems it creates have wider application to the Canadian scene than do its more spectacular companions.

Water Supply Systems

All modern water systems include sources, treatment facilities, pumping stations, storage vessels, and distribution systems. These components vary in relative importance from site to site, but the basic principle is that a good water system must be capable of delivering potable water to its subscribers, in the quantities required, twenty-four hours per day and three hundred and sixty-five days per year. It is a credit to the industry that this fundamental requirement is being met, without apparent difficulty, throughout the country.

The individual who turns on his tap to draw a glass of drinking water, at any hour of day or night, is unlikely to fully appreciate the major effort that has made his action possible. His glass of water has received most careful protection since it entered the system at its source. It has been pumped, filtered, treated with chemicals, stored, and pumped again into the distribution system, where it awaits the opening of a tap. At every step along the way it has been kept free of pollution, and its delivery in pure form at a distant point represents fulfillment of the responsibility of the waterworks organization.

Modern water supply systems are of robust design, and are expected to remain serviceable when subjected to storm damage, flood, drought, severe frost, or even fire. Designers take cognizance of local conditions, and provide for continuity of operation under all foreseeable conditions. Design is thus the cornerstone of system reliability as we know it today. However, some of the design criteria are based upon economic considerations, as the public quite understandably demands low water rates. In consequence, water utilities are not entirely self-sufficient; they must rely upon others for certain services and materials. Electrical energy is provided by the electric utility; transportation services deliver chlorine and other chemicals as required, to avoid excessively large on-site storage requirements. Highly reliable supporting services are therefore essential to the maintenance of standards; the water chain can only be as strong as its weakest link.

If we now look at a conventional water supply system in an area subjected to the effects of a nuclear explosion, it is not surprising to discover that its capability, and indeed its very existence, may become seriously threatened. Should vital components of the system be located in the area of total destruction, it follows that they will be totally destroyed. In many cases their loss would cause the entire system to become useless; in others, it may be possible to utilize surviving components in an improvised post-attack water distribution utility. No amount of advance preparatory work will significantly improve the situation in the vicinity of ground zero; but who knows where ground zero will be? We do know that despite the very large areas of total destruction that would result from a nuclear attack, there will always remain vastly greater areas which would be subjected to damage of a lower order, or to fallout only. It is in these areas that there will be survivors, and they will require water to fight fires, to drink, to carry out decontamination. The water utility must direct its planning towards reinforcement of the success represented by people and equipment that manage to survive the initial attack.

It is evident that effective post-attack recovery begins with advance planning and preparatory measures. Although absolute protection of waterworks from blast is not attainable, there is, nevertheless, a great deal that can be done, at reasonable cost, to protect plant personnel and equipment against the effects of low-order blast, including its secondary effects. The "hardening" required for this purpose will depend upon the importance of the particular structure to the system as a whole, but in any case will automatically include a degree of protection against thermal and fallout radiation. Among the possibilities are:

(1) Provision of a central protected area for the operating crew, complete with facilities for two weeks' existence (in the plant basement if possible).

(2) Provision of small protected operating areas in various key parts of the plant, convenient to vital operations such as pump control stations, chemical feeder controls, filter banks.

(3) In key areas, take action to minimize the production of blast-induced missiles, which can injure personnel and damage equipment. This involves the shuttering of windows and covering of frangible materials used in construction of the building.

(4) More delicate equipment should be protected from missiles by wire screen cages or other

means. Simple shock mounting is advisable, and not unduly difficult.

(5) While extensive structural reinforcement is not feasible, weak components should be strengthened. It is axiomatic that overhead structural slabs must be capable of carrying debris loads to which they may be subjected in the event of building collapse, which on the average could be expected to occur at 6 or 7 psi.

(6) Underground piping, reservoirs, submersible pumps and intake structures are, as a general rule, highly resistant to blast. Superstructures in the system do not enjoy this degree of resistance, but in many cases stiffening, shoring and bracing will be of assistance.

(7) Plant laboratories, which are essential to quality control, must be located in areas enjoying maximum protection. In large systems, quality control can be ensured by establishing a second laboratory at some distance from the main one.

(8) Alternate water sources should be tied into the system whenever feasible.

(9) Auxiliary power and communications systems are essential.

(10) Ideally, automatic and remote control systems should be installed for plant operations, with control panels located in protected areas.

Thermal and fallout radiation can still present a serious threat at distances from the explosion where the blast wave ceases to cause damage. Protection against terminal radiation is not difficult at the distances with which we are concerned; it is primarily a matter of good housekeeping, and avoiding line-of-sight situations for plant personnel or inflammable contents. The normal design, location, and operation of waterworks are such that the thermal effect of explosions can be dealt with more readily than the other nuclear phenomena.

Fallout radiation, on the other hand, confronts the operators with a host of unfamiliar problems. If plant shelters are available before an attack, waterworks crews are assured of adequate protection against gamma radiation. But while they are enjoying the protection of such shelters, the water source may become contaminated with alpha, beta and gamma emitters to the extent that the ability of the system to deliver potable water comes to an abrupt end. Moreover, post-attack maintenance and repair work on exposed parts of the plant and its distribution system could easily lead to radiation casualties among the staff. The overall problem, which is a most important one to the survival of Canada, does not lend itself to a simple solution.

In an area subjected to heavy fallout, water in protected storage becomes a key asset to survival. Such water includes that contained in the system, other than in open reservoirs, before the arrival of fallout. During the survival period, water held in bathtubs, domestic containers of all types, building piping systems and heating systems, may be the only potable water available. It must not be wasted for sewage disposal, fire-fighting or decontamination. Water in deliberately flooded basements is suitable for these purposes. Water from any outside source should not be consumed until assurance has been received as to its purity. In the survival period, or shock phase, the water utility will be concerned with damage assessment, conservation measures, and the supplying of priority customers, such as hospitals and fire brigades. As recovery becomes feasible, damaged parts of the system are repaired to provide minimum water requirements, and surviving components are operated to the extent made possible by treatment facilities, manpower, and electrical energy. The recovery period gradually blends into a reconstruction phase, and at this time the aim must be to restore the full operational capability of the utility.

The most essential prerequisite to successful post-attack operation of water utilities is sound judgment on the part of management. This presupposes prior training; one cannot intelligently cope with a problem unless one knows what the problem is. Similarly, to permit the exercising of judgment and making of decisions, a dependable communications system is mandatory; situation reports must flow in and orders must flow out. Broad management decisions will include the establishment of priorities and the conservation of resources, including waterworks personnel.

Among the considerations for operating in fallout areas are the following:

(1) Potable water may have to be distributed during the shock phase to people in shelters whose supplies have become depleted. This may involve the setting up of a number of water points, with further detailed distribution being undertaken by the civil defence organization.

(2) An exposure control system must be used for personnel required to work in fields of radiation.

(3) Crew exposure must be minimized by restriction of activities to most essential requirements, particularly during the first few days after an attack.

(4) Crew exposure time can be reduced by the use of fast vehicles, or even helicopters and light aircraft, if these can be made available. Similarly, increasing the work force will tend to reduce individual exposure time, but this will not usually be feasible in time of emergency.

(5) Protective clothing will be necessary for staff required to work in contaminated areas.

(6) Radiac instruments, which read dose rate and total dose, are essential for all crews.

(7) Advance dispersal of stores and equipment to key locations would be most helpful.

(8) Plant laboratories must be able to detect the presence of radioactive substances in the raw water supply.

(9) Although the normal processes of sedimentation, filtration, flocculation and coagulation will remove radioactive solids from contaminated water, the equipment will soon become dangerous to its operators. Some two or three percent of the total radioactivity, including radio-strontium and barium, in soluble forms, will still remain in treated water. These soluble radioisotopes can be removed by ion-exchange or distillation methods, but the normal water plant lacks the necessary equipment, which in any case is unsuited to large-scale use.

(10) It must be borne in mind that water for fighting fires, decontamination, and even sewage disposal, need not be treated during an emergency. This contaminated water could be delivered through the surviving distribution system, bypassing treatment facilities. The obvious disadvantages are that some of it may be consumed, and the distribution system would be contaminated. Also, it is possible that some of this radioactive water might find its way to hitherto uncontaminated sources.

(11) Alternate sources would be invaluable, particularly if they are deep wells; but they are obviously useless unless they are interconnected to the system.

(12) On the credit side, it is certain that the demand for water will decrease during the recovery phase. Nevertheless, a rationing system will have to be imposed, and wastage of potable water in any way must not be permitted.

(13) If the worst comes to the worst, and there is no potable water for survivors in some areas, it would be foolish to allow people to become dangerously dehydrated or die of thirst—even if they have to drink water containing radio-toxicity which would normally be completely unacceptable.

In Canada today, the state of preparedness of water utilities with respect to peacetime disasters is excellent. Paradoxically, the water industry is ill-prepared for the aftermath of nuclear attack. The talent is there, but insufficient attention has been devoted to the problem, which, of course, we all hope will never arise. Nonetheless, if we are to be truly prepared for a wartime emergency, the assurance of an adequate water supply is of paramount importance. Considerable progress in this direction can be made at relatively minor expense, e.g., in drawing up plans for survival and recovery, training of plant and auxiliary personnel, and improving the quantities and dispersal of reserve supplies and equipment. Other forms of action begin to cost more money; laboratory monitoring and radiochemical analysis equipment; provision and maintenance of radiac-equipment for field use; hardening of structures and protection of equipment; provision of shelters; improvement of standby power and communications systems. There is a need to review these requirements in the light of our overall readiness posture, and to ensure that water utilities receive the guidance and assistance necessary to enable them to have some hope of meeting their commitments in the event of a national nuclear emergency.

Sewage Systems

The maintenance of public health in our crowded modern cities would not be possible without high standards of sanitary engineering. Waterborne diseases are kept under tight control by a combination of water treatment, efficient sewage disposal methods, and public education. Sanitation of the environment is the major concern of public health authorities, and in Canada, with the help of the engineer, their efforts can be said to be most successful.

Direct nuclear attack on urban areas would destroy or damage sewage treatment plants and other system components. Survivors in the area affected would immediately find themselves in a primitive sanitary environment for which they are ill-prepared. In the absence of a sound plan for prompt remedial action, it would not be long until diseases of epidemic proportion were added to their list of problems. In rural areas, the situation would be less serious, due to the probability of escaping blast effects, smaller population density, and general self-sufficiency of existing sanitary systems.

During the shock phase, the population left in areas covered by fallout must remain in shelters. Sanitation in these circumstances is indeed a problem, but not an insurmountable one. Crude devices such as excreta bags, chemical toilets, and underground injection wells will have to be used by many people. These sanitary improvisations are not pleasant, but in the context of survival, they are acceptable. In shelter locations enjoying flush toilets and an operational sewage system, the situation will be much better—provided sufficient water is available to permit proper use of the fixtures.

From the standpoint of blast resistance, sewage systems are somewhat less vulnerable than water systems, as usually many of the process structures involved are built below ground level. Exceptions to this generalization are digesters, office buildings, some pumping stations, and aboveground electrical services, including pole-mounted transformers. Hardening of structures and equipment along the lines described in Chapter 2 is quite feasible, bearing in mind the diminishing returns per dollar when one attempts to provide protection beyond the overpressure at which main structures will collapse. The need for auxiliary power and communications is imperative under emergency conditions.

In many of our smaller systems, sanitary sewage flows entirely by gravity from all customers connected to the systém, to the treatment plant. In others, chiefly due to topographical considerations, lift stations are required to raise the raw sewage to higher elevations, from which it can again flow by gravity. The pumps in these lift stations are usually electrically operated. In the event of prolonged power failure, the results would be appalling. The importance of standby power, and/or pumping equipment driven by gasoline or diesel engines, cannot be overemphasized.

In modern communities, sanitary sewage is brought to treatment plants by a network of pipe drains, while storm sewage is conducted in a completely different underground duct system. However, during periods of heavy precipitation and runoff, some storm water inevitably finds its way into the sanitary system, greatly increasing the volume of water requiring treatment. For this reason and due to the fact that parts of the system may be damaged by blast or ground shock, it is to be anticipated that sewage plants serving areas subjected to fallout will soon be receiving highly radioactive sewage. Before long, the operators would start being irradiated by gamma emitting contaminants in the settling tanks, grit chambers, digesters, sludge filters, conveyors, aeration tanks, etc.

At this point there would be a great temptation to open the plant bypass and dump raw sewage into the receiving body of water. This temptation must be resisted if it is humanly possible to do so; for in the majority of cases it would pollute the water supply of the local area and that of all other centres using the same source.

If treatment of sewage is to be continued without sacrificing the operators to gamma radiation, emergency procedures must be invoked. Process supervision must be reduced to a minimum, employing automatic controls to the degree possible. Massive shields, either pre-positioned or improvised, should be erected between operating galleries and the vessels or equipment containing radioactive contamination. A carefully controlled exposure system, with all its attendant instrumentation, will be necessary. Sewage plant operators should be based in a central shelter, with satellite protected areas being available at strategic locations throughout the plant.

In plants damaged by blast or surrounded by heavy fallout, restoration of treatment facilities would obviously be delayed. Partial treatment, consisting of coarse screening and chlorination of raw sewage, may be the only action possible during the first few days. Large quantities of chlorine would be required, although for several days after the attack, the volume of sewage should be well below normal. Eventual plant recovery will only become possible as radiation levels decrease, and will commence with decontamination measures. Subsequently, and subject to the availability of electric power, additional plant processes could gradually be restored and reactivated.

In some smaller communities, where soil conditions and topography permit, it may be advisable, during the early post-attack weeks, to abandon treatment plants in favour of sewage stabilization ponds. These sewage lagoons, as they are known in North America, have met with considerable success in many municipalities in the Canadian Prairies. They have the great advantage of being able to purify raw sewage without power, chemicals, or close supervision. Although their construction in densely populated areas is unacceptable in normal times, they could well prove to be the answer for some locations in time of emergency. Furthermore, sewage lagoons can be constructed very quickly by the use of mechanical equipment. This method of sewage disposal may also be resorted to in crowded reception areas unaffected by fallout, but in which normal disposal facilities are overtaxed.

Maintenance and repair requirements on sewage lines in the post-attack period should be minimal, particularly in the case of gravity systems. Apart from portions subjected to severe blast and ground shock, underground collector systems could be expected to function, without attention, for prolonged periods. Routine clearing schedules could be suspended until radiation dose rates subside to acceptable working levels. Emergency repairs required in the meantime must be handled with precautions similar to those outlined for water distribution systems.

Electric Utilities

Virtually everything done by civilized man involves the use of electricity in one form or another. Our homes, transportation systems, and industries, including the other major utilities, cannot function without it. There is perhaps no other single commodity so vital to all aspects of modern life. During recent years the reliability of the electric supply has been so excellent that most people no longer give it any thought.

The high degree of dependence leads inevitably to a high degree of vulnerability. This point was brought home vividly during the major power failure of 9th November, 1965, in certain of the North-Eastern United States, and part of Ontario. The power outage directly affected the lives of thirty million people, and was the worst in history in terms of the number of people involved. It caused many people to wonder what might happen after a nuclear attack.

If electricity is important to us in peacetime, its availability subsequent to a nuclear attack may spell the difference between life and death for the survivors. Power will be urgently required by shelter occupants; it will be needed to pump water and sewage, to effect decontamination, and to facilitate all forms of restoration and recovery.

Electric power installations include heavy duty industrial type equipments of inherent ruggedness, and in general they are more resistant to blast than other industrial buildings to be found in the same area. They will not, however, survive severe blast, and if they are subjected to it, their reconstruction time will be such as to preclude their usefulness in the recovery period. On the basis of actual tests, it would seem that plant and equipment survival begins to become a possibility at distances from the explosion at which blast overpressures have receded to 5 or 6 psi or less. The damage caused by blast of this order can be compared with that resulting from a hurricane or violent windstorm. Wires will be down; some wooden poles and pole-mounted transformers may fall; relays, meters, sub-station cubicles, and battery cells may be damaged; but these items can be repaired in a reasonably short time with materials normally available in stock. Components such as circuit breakers, insulators, disconnect switches, buses, and pole-line hardware may be expected to come through unscathed. Thermal radiation associated with the magnitude of blast under consideration will cause some scorching, but if simple precautions are taken, it is a much less significant problem. Heavy fallout, on the other hand, while not causing direct damage, will most certainly impede restoration work.

Transmission and distribution lines at these ranges are generally more vulnerable than generating stations or other fixed installations. Overhead lines running radially to the blast wave will suffer less damage, and underground distribution systems would not be affected. Unfortunately, the latter are not too prevalent at the present time.

The aim of electric utilities must be to minimize load denial to the survivors of an attack. Inability to provide electrical service in the post-attack period would mainly be attributable to blast effects on transmission and distribution systems. Apart from heavily damaged areas, from which survivors will probably have to be evacuated in any case, there is every reason to hope that restoration of power will not be unduly delayed. For one thing, most Canadian provinces have a multiplicity of interconnected power sources, and even if some of them are eliminated by an attack, the remaining stations should have adequate generating capacity to cope with requirements of the shock and early recovery phases. Generating facilities are widely dispersed, and as their total peacetime capacity is, in many areas, well in excess of peak demands, those that survive the attack should be able to handle the sharply reduced requirements of a post-attack situation.

Waterpower is the major source of electrical energy in Canada. There are also many thermal generating stations, usually fired by coal or natural gas. In recent years, nuclear power generators have begun to appear in increasing numbers. Hydro-electric generating installations are normally found in remote locations, and their vulnerability to nuclear attack is decreased accordingly. Nuclear power stations constructed to date are also in locations unlikely to be attacked. On the other hand, many thermal plants are to be found in or near some of our major cities.

In the Province of Ontario, electricity is transmitted over the routes of main power flow at voltages of 500, 230 and 115 kilovolts. One only needs to look at a map of the distribution system to appreciate the large number of hydroelectric and thermalelectric plants which feed the grid. There are innumerable alternate power routes within the Ontario system itself, together with several points of power interchange with other provinces and states. Insofar as the main transmission system is concerned, a high degree of invulnerability has been achieved.

With minor exceptions, power at the above voltages is sold to a large number of municipally owned electric utilities and local electric systems. From the receiving sub-stations, these electric utilities serve the subscribers in their areas, at the voltages required, by means of primary and secondary distribution systems. Thus if a municipal system should be subjected to severe blast, thereby losing a portion of its distribution system, the availability of a live 115 kilovolt transmission line at its sub-station may not have too much immediate significance. One problem is that many of the stores and equipments available for maintenance and repair of the main transmission system are of little use within the municipal systems. Mutual aid agreements between municipal utilities may provide a partial solution, recognizing the impediments to movement created by a blast and fallout situation.

All the principles enumerated in Chapter 2 concerning pre-attack preparation can be applied to our electric power systems, and do not require to be repeated here. The post-attack procedures are also similar in kind, if different in detail. Fallout radiation levels could well result in load denial to survivors, even though transmission lines may still be energized. The need for developing procedures to restore service under such conditions cannot be over-emphasized.

In summary, some of the additional recommendations hereunder may be worthy of consideration in attempting to improve the industry's state of preparedness:

(1) If a strategic warning is given, thermal electric generating plants could be shut down and evacuated in areas where hydroelectric facilities could cope with the load.

(2) Rationing systems should be worked out and invoked during impending emergency. Load control also necessitates load shedding arrangements, involving the opening of feeders as necessary.

(3) Manual operations throughout the system should be converted to automatic. Remote control systems should be expanded.

(4) Key installations, such as sub-stations, switching stations and system control centres should be located outside probable target areas.

(5) For the long-term, underground distribution systems and subterranean generating and transformer stations and kiosks would result in vulnerability reduction.

Gas Distribution Systems

Although most Canadians live in the more southerly latitudes of the country, the climate is such that their homes and other buildings must be heated for six months or more of every year. In most areas, during the winter months, life could not be sustained without heat. A number of industries compete to serve the great demand; coal, gas, oil, electricity, wood, sawdust, etc. Quite apart from domestic requirements for heat and hot water, very large quantities of fuel are consumed in industrial processes of all types.

The natural gas industry has undergone tremendous expansion during the last twenty years. New gas fields have been discovered, mostly in Western Canada. Major developments in pipe-line transmission techniques have enabled the industry to gain new markets from coast to coast, not to speak of gas exports to the United States. As a large segment of our population now depends upon gas, it will be of interest to briefly review some of the problems with which the industry would be faced in the event of nuclear attack.

One of the oldest and most experienced gas companies in Canada is North-Western Utilities Limited, whose head office is located at Edmonton, Alberta. The company draws its main supplies of natural gas from a number of oil and gas fields located within a one hundred mile radius of Edmonton. It distributes the gas, over a network consisting of thousands of miles of pipeline, to all major communities in Northern Alberta. It should be noted that the City of Edmonton, which is approximately at the centre of the system, and which is its biggest customer, is deemed to be a possible target in a major nuclear attack on urban centres of the continent.

The company's declared aim, should a wartime emergency arise, is a commendable one: "The intention of the management of the company is to maintain under these circumstances (i.e. nuclear attack) essential gas service to the target area, and to those other communities served by the company, and to be in a position after an attack to restore natural gas service in areas which can be rehabilitated."

To achieve its aim, the company has prepared a plan for the guidance of its officers and employees, *and* their families. The plan goes on to define the locations of relocation centres and emergency operating centres. Officials are detailed, by their appointments, to take charge of these operations. Manning, administrative arrangements, fallout protection, and emergency communications are all considered. In an emergency the company president and some of his staff move to a location in Central Alberta, where they form an Emergency Inter-Company Administrative Headquarters in conjunction with the Canadian Western Natural Gas Company Limited, which holds the franchise for Southern Alberta. There could be no better way in which to guarantee the benefits of mutual aid.

Other gas utilities in the various provinces have different arrangements, but by and large, the industry is alert to the need for emergency planning. This is largely due to an appreciation of the dangers inherent in the commodity they handle. Systems are designed to enable areas of fires and explosions to be quickly cut off from fresh supplies of gas; crews are trained to cope with such disasters.

Lest the picture be allowed to appear too rosy, it should be pointed out that most of the post-attack problems which would plague other utilities will also frustrate the gas utilities in their attempts to maintain or restore service:

(1) Aboveground operating stations have little or no blast protection.

(2) Ability to work under fallout conditions requires improvement. This involves training, equipment, and strategically located shelter areas.

(3) In some gas fields, the product enters transmission lines at the field pressure of approximately 600 psi. Gas from oil fields, on the other hand, must pass through huge compressors before it is suitable for transmission. Standby power for such purposes is frequently inadequate.

(4) Line stores and spare parts are inadequately dispersed, and often located in probable target areas.

(5) There is a great need for increased use of automatic equipment, such as block valve closers, to replace manual operations.

The above list of shortcomings, which is by no means a comprehensive one, is well known to the gas utility companies. All the existing deficiencies could be eliminated, given time and money. With regard to the latter, it is a matter of priority of expenditures. The gas industry is a young one, and faces keen competition in marketing its product.

In 1963, a detailed study was made in Southern Ontario of the industry's capability to continue operation of its facilities under nuclear attack conditions. The study was co-ordinated by the Ontario Natural Gas Industry, which consists of a number of municipal gas utilities. They were assisted by the pipeline transmission company and the Bell Telephone Company of Canada. A rather heavy attack pattern was assumed for exercise purposes, and its consequences were examined in detail insofar as gas utilities were affected. The

final recommendations made by the exercise committee demonstrate an awareness of the situation:

1. Each company should prepare a comprehensive Company Emergency Measures Plan. This plan should include the following points:
   (a) General instructions for the employee on the action to be taken if the alarm is sounded.
   (b) General outline of the company's operating policy and procedures.
2. Each company should conduct an intensive and continuing program to acquaint the personnel with the radiation hazards, exposure control, personal protective measures and familiarization with the company and industry Plans.
3. Each company should conduct an assessment of its buildings and facilities to determine the areas which will offer the best protection from radiation. These areas should be identified as such and made known to their employees. Provision should be made for proper shelter protection with adequate supplies for any personnel required to remain on duty.
4. It is possible that all or a good portion of the service throughout the province could be lost through damage to distribution systems in the target areas. The distribution companies have an obligation to the Ontario Industry and the public at large to ensure that damage to their facilities does not jeopardize the supply throughout the entire province. This can be done with gadgetry, such as the installation of line-break devices or manually by manning the strategically located facilities and providing the necessary protection against radiation for these employees. It is the sub-committee's *recommendation* that in the course of redesign and upgrading of gate stations the necessary facilities be installed. Similarly, the transmission companies should examine their compressor stations which are self-contained as far as main power supplies are concerned but which in some cases are dependent on external sources of power for control.
5. During the reconnaissance and initial rehabilitation phases, the Gas Industry will be largely dependent upon their own radio communication systems for the flow of information from the field to the operational headquarters as well as control of their field forces. Therefore each company should examine its radio communication system to assess its capability under emergency conditions. Particular attention should be paid to its dependence upon external power sources, the operation of different frequencies, etc.
6. Each company should check with its local telephone office to ensure that its main business services and key operating personnel are included in the Bell Telephone Company's line load control. The Ontario Gas Industry should advise the Telephone Company of their specific communication requirements for the Gas Industry to continue operating under these emergency conditions. This information should include the location of administrative centres, volume and pattern of traffic expected.
7. It is imperative that the Gas Industry be able to maintain control of their specialized equipment, vehicles and skilled personnel as well as their communication systems.
8. It was agreed that public information pamphlets should include a chapter on each utility, giving detailed instructions to be followed under emergency conditions.
9. Each company should provide the Department of Defence Production, Emergency Supply Planning Branch, with a list, by location, of materials normally maintained within the province. This should be supplemented by similar lists from pipe and fitting manufacturers.
10. Operating and specialized personnel should be discouraged from taking part in civil defence organizations. Each company should point out to their operating personnel the role that they can be expected to play and should adopt as company policy the discouragement of their key personnel becoming committed to civil defence organizations.
11. During the course of normal growth and expansion facilities, consideration should be given by each company to the locating of special and essential facilities outside the probable target areas. This would apply to the storage of large stocks of materials and specialized equipment.
12. The Ontario Natural Gas Industry if it receives any warning of attack is in a position in which it can institute fairly effective emergency measures planning. It is therefore *recommended* that the Ontario Natural Gas Industry be included in the Department of Defence Production Emergency Supply Planning Branch's fan-out system in order that the industry may go on standby with the Emergency Government. Contact with the Ontario Industry should be through the Trans-Canada Pipelines despatcher who in turn would inaugurate a fan-out to each distribution company despatch office. Further fan-outs would then be initiated within each company.
13. The facilities of the Natural Gas Industry are relatively susceptible to sabotage. Each company should examine its facilities and decide which would be susceptible. Arrangements should then

be made by the company to provide the necessary security of their installations under emergency conditions.

Recommendations and Conclusions

It is abundantly clear that the various public utilities are interdependent; water and sewage works require electricity and fuel; electric generating stations require water and sewage facilities, etc. The survival of one utility therefore requires survival of the others, and from the standpoint of government, the post-attack problems of our public utilities must receive coordinated guidance and assistance. Technical requirements at the working level will differ due to dissimilarity of equipment, but the pre-attack and post-attack action required of all the utilities is closely comparable.

In our favour is the fact that the public utilities have, in being, the best possible types of organization upon which to build. They are accustomed to emergency; it is part of their everyday thinking. The population depends upon public utilities for its very survival in normal times. After a nuclear attack, national recovery itself is only possible in an environment of operational utilities. It is therefore a matter of elementary logic that action should be taken to eliminate the shortcoming in our current state of preparedness.

In attempting to stimulate survival planning, one major difficulty usually encountered is the tendency of most people, when contemplating the consequences of nuclear attack, to think of themselves as being in the ground zero area. The well-publicized effects data relating to such an eventuality contribute to a reaction of futility and hopelessness; and hence nothing gets done. Without in any way denying the magnitude of the calamity suffered by people and installations in an area which is directly struck, emphasis must be placed upon the indisputable fact that millions of people and millions of square miles of territories will escape the immediate effects of any conceivable attack. This is particularly true in a country like Canada.

Money is definitely a limiting factor in improving the state of readiness of our public utilities for nuclear attack. In many areas competition is keen and profits are marginal. Boards of Directors are understandably reluctant, in the circumstances, to approve expenditures for items unrelated to normal operating requirements. Many of the wartime needs, however, would contribute to efficiency in peacetime. In this category can be placed auxiliary power, improved emergency communications, and automation of equipment.

Other relatively low-cost forms of preparation, which can be undertaken jointly by the utilities and various levels of government, include the following:

1. Training of plant crews and auxiliary personnel in the field of nuclear effects, with emphasis upon post-attack restoration and operation.
2. Preparation of readiness plans, and standard operating procedures for emergency use.
3. Mutual aid arrangements.
4. Public education, relative to utilities and conservation measures, and including technical advice to municipal governments. An example of the latter is the "Emergency Water Services Checklist", prepared by the Department of National Health and Welfare.
5. Preservation of essential records. It is important to have all records and plans of public utility installations microfilmed and safely stored at every appropriate emergency government headquarters facility.
6. Provision, in the design of future installations, of protected areas and other features related to the survival of personnel and equipment.

When one considers what can be done in the way of protective improvements to improve the posture of existing utilities, the question of cost assumes more serious proportions. An appreciation of the problem facing Canada leads one to the conclusion that efforts in this direction should be made "from the outside in". Fallout protection is relatively cheap, and may be all that is feasible from a financial point of view. Low-order blast protection can be achieved at moderate cost, while protection against severe blast can be prohibitively expensive, and will no doubt have to be restricted to vital points of the system. It goes without saying that all decisions pertaining to protective construction will be taken in cognizance of the probable threat to the area in question.

Increasing inventories and dispersal of supplies will be impractical in many cases, but in others such action may not be incompatible with peacetime practice. In any case, emergency plans must provide for appropriate action in this regard.

The provision of laboratory monitoring facilities, and radiac instruments for plant and field use, presents a problem. Apart from the initial capital cost involved, maintenance and calibration must be considered. These items are, nevertheless, deemed to be indispensable in areas susceptible to fallout. Although academic training for operators working in contaminated areas is normally based on the time to the minus 1.2 power decay curve, the results obtained are often pessimistic; and the actual situation might not be so gloomy. If properly calibrated dose rate meters are available, exposure control can be more accurately and rigidly controlled.

In conclusion, it is again stressed that survival of the populace depends in large measure upon survival of its utilities. Much has been done; much more can be done at nominal cost; and the remaining requirements become expensive. Each step along the way represents a potential saving of many lives. If nothing more is possible, let us at least get on with the preparation of emergency plans, remembering that even a poor plan is better than no plan at all. ▲

IMPACT OF DISASTER ON COMMUNITY LIFE

by

Emergency Welfare Services Division
Department of National Health and Welfare

At a Seminar on "The Family Agency's Role in Disaster" conducted by the Emergency Welfare Services Division at the Canadian Emergency Measures College, Arnprior, Dr. Russell R. Dynes, Co-Director of the Disaster Research Centre of Ohio State University presented two papers; (1) "The Effects of Disaster on Community Life" and (2) "Functioning of an Organization Under Stress". The Ohio Centre has as its purpose the study of community organizations experiencing stress, particularly in the emergency period in disaster. Its program has two aspects: one is a field job; the other is laboratory. Their research is guided by the following work concepts: the prime interest is natural disasters; a disaster study can be approached by a number of ways; to find the model, instant natural disasters are studied; research is done immediately after impact; the object of research is to find answers to questions, namely, What happens? What is it? What is involved? What is the impact of a disaster on the family? What is the effect of a disaster on the total community?

The following is a summary of Dr. Dynes' presentations as given at this Seminar, which should be of interest and use to all emergency planners.

Current Research Findings

Misconceptions are Prevalent

The Centre tries to break down misconceptions and myths and people's tendency to generalize—which are most often built on false assumptions.

Certain words, used to describe the overall disaster situation, such as "panic", "looting", "dazed", "helpless mass of people", "a break-down of social order", "severe mental derangement" are almost invariably heard and read. Most of these effects are myths and misconceptions of what really happens in time of natural disaster immediately after impact. The Centre's research has established that mass panic and looting do not occur, and that notion that the victim population is stricken and dazed is a misconception. In fact disaster victims are the first to help themselves, and they do most of the rescue work.

Reports Are Exaggerated

Further from their research they have concluded that: "all disasters are at first reporting exaggerated". This is understandable, as no one has a very accurate picture of the disaster event. At the site of the disaster the familiar is gone and some disorientation exists. At the time of impact, traditional barriers to communication tend to be lowered, so the people who survive communicate what they see. This tends to be wholly negative. People outside the impact area also see the negative and this they communicate to others. In addition if the police, for control reasons, cordon off an area larger than the actual disaster area, this only tends to increase the scope of impact in the minds of people. The public has to depend on mass media for information. News media, whether radio, newspaper, or TV, frequently place emphasis on the dramatic and tragic. If pictures are taken, it is of the rubble, seldom of the building right next to it still standing. When news men interview officials, what is said is often interpreted and reported as fact rather than surmise based on incomplete reports and unconfirmed data. If disaster occurs at night and there is no electricity, the evaluation process can also be further distorted. The publicity, exaggerated though it is, can have the positive effect of arousing a community and individual citizens.

The Family as a Group has Strength

One of the most important reference points in guiding welfare services is the concern of families about their own members. They will do everything to help one another; the extended family will help in the recovery phase. Disaster tends to increase rather than decrease the unity of a family unit. Immediate danger and loss sustained by the family creates a therapeutic social system and ameliorates and changes many of the situations existing prior to disaster. Common dangers make everyone forget old quarrels. Experience in Poland and Britain showed family life to be strengthened rather than weakened by bombing attacks.

Threats of dangers are from outside the system and causes are clearly perceived and specified. One can direct action in relation to an external objective source of worry. There is a sense of clarity, of urgency and importance not found in common family crisis. You can see what needs to be done and do it. Moreover disaster provides a non-structured social system, which enables people to see the possibility for change. It can wipe out old inequities or injustices. It is a period of limbo, but there is hope that change is possible. Culturally derived discriminations tend to be eliminated. There is danger, loss, suffering but everyone is affected. Before and after disaster on the Gulf Coast, people

board up homes and have "hurricane parties" which are festive occasions. This has a therapeutic effect as people share common problems.

From the community point of view, if we isolate or remove families from the immediate disaster area, the process of adjustment after the disaster is more complicated. Where this is necessary, it is recommended that families be kept together with other families also affected and near the disaster site.

For those who are employed in social agencies and do family counselling thse findings could sound like a doctrine of divine salvation through disaster. It is important to recognize however, the organizing as well as disorganizing effects of disasters as a basis for planning.

The Context of Organizational Behaviour

Viewing a community broadly, it is set up to deal with the normal, but in disaster the routine pattern of organization does not work. If the disaster is disorganizing, it is evidenced particularly at the level of the relationship between organizations. Some of the things which are significant for understanding the changed context of organizational behaviour are enumerated.

1. After impact certain things become important; others less important. This seems to arise rather spontaneously. Suddenly the whole question of the preservation of life, namely rescue and care of human victims is the immediate task and is given high priority. In contrast attempts to restore and maintain essential community services must be very selective. If for instance electric facilities are to be restored, they should be restored firstly at the hospital or police station, not in residential areas. Thus, all community resources are considered relevant and the question is, where does one begin? All property can be seen as communal, and private property as a possible resource to be used for the whole community and requisitioned for community needs. The problem of community order also is related to the preservation of life and immediate restoration of essential services. Community personnel are committed to the task of guarding property, patrolling danger areas, and maintaining public morale. The mass media provides a continual source of information about the effects of the disaster, in the context of "we". Many other activities such as schools are suspended. Unless they deal with particularly relevant factors like control of food, certain things are overlooked. Thus the total energies can be placed upon particular types of activities. There seems to be an implicit agreement about this.

NATIONAL HEALTH AND WELFARE

Mr. P. H. Stehelin, Director, Emergency Welfare Services, Department of National Health and Welfare (left) greeting Dr. R. R. Dynes, Co-Director of the Disaster Research Centre, Ohio State University, on his arrival in Ottawa prior to participation at a seminar on "The Family Agency's Role in Disaster" held at the Canadian Emergency Measures College, Arnprior.

2. Conflicts which exist between organizations before impact tend to be minimized. Controversy is played down, though it may come back at a later point.
3. Expansion of citizenship role develops. Generally the minimum obligation that a citizen has is something like observation of the law, voting, or a generally positive attitude toward his community. Suddenly, in disaster, the citizenship role expands to active involvement. This may account for the mass of volunteers. Community organizations have to work within this context.

Types of Organizations Functioning in a Disaster

For purposes of analysis there are four types of organizations with two variables as follows—(1) task of organization and (2) structure of organization.

(1) Task of organization—

An organization may carry its old routine tasks, or assigned every day ones into the disaster situation. For example, police have control of traffic, a fire department fights fires and a radio station transmits news. On the other hand there may be new or non-regular tasks, such as a national guard battalion may be charged with the responsibility for provision of water for a community, or nuns teaching at a parochial school may begin to sort and distribute clothing in a relief centre.

(2) Structure of Organization—

In an old or established structure the relationship of its members remain relatively the same in the emergency structure. For example, the members of a fire department work together every day, they know one another and their relationship after the disaster is relatively the same as it is prior to the emergency. New structures develop, expanding from a small core, or they may involve some new entity. The crucial factor is that they have no previous disaster existence, e.g. search and rescue teams which might be partly planned or may be totally spontaneous, but the actual working group only comes into being during the emergency period.

Type 1. *Established Groups* carrying out their regular tasks, e.g. police, fire departments, military, are initially involved in any community emergency. There is a community expectation that they will be involved and they are notified. They can mobilize rather effectively and efficiently. They can assess the demands that will be made upon them. In some kinds of situations they are the only ones involved on impact.

Type 2. *Expanding Groups* are those which normally perform regular tasks and are usually the result of community organization planning, e.g. Salvation Army or other Church groups. Their emergency responsibilities are on paper, but actually they never have worked together in this situation. They are stand-by organizations in a state of readiness with latent disaster tasks. Usually they have a small central permanent core of workers during a non-emergency period. During normal time their activities are not directly related to community emergencies. When a disaster occurs the pre-emergency structure provides the name of the organization and core of permanent workers for the new structure of the expanding group. Their mobilization is usually slower and more difficult than Type 1.

Type 3. *Groups with new functions.* Groups which have an existing structure may suddenly be involved in new tasks, e.g. a construction company whose men and equipment are called upon to dig through debris and assist during rescue operations. The same men are working but at a new task. This type is the most numerous of all groups in emergency disasters. Their members often work with Types (1) and (2), e.g. a church group may staff and operate a shelter under Red Cross direction but the participants become involved as a group, e.g. volunteers may have a pre-existing structure with friendships and become involved not unlike the second type but not as early. The community expectation does not involve them as directly but they are ready to and can help.

Type 4. *Emerging Groups.* Somehow new ad hoc groups come together and are involved in emergency tasks. A city engineer or a local highway representative or several persons may suddenly assume leadership roles and assign tasks within such groups. This type of group is the most difficult to conceptualize because they do not exist prior to disasters and when the emergency is over, they tend to dissolve. Usually they are small ephemeral groups that bear no name. They emerge in large scale disasters and play a very important role. In a community at time of disaster there tends to be: a lack of co-ordination among these various groups; there probably will be no overall control of activity; there will probably be lack of information. Co-ordination, control and information-getting are tasks which tend not to be anticipated and therefore not included in any of the existing groups.

Sociological Analysis of the Four Groups

Sociologists in the Disaster Research Centre analyse the above four groups as follows.

Group 1. The "established groups" are called complex organizations with a bureaucratic structure. In a major emergency they tend to do tasks at which they are best and try to depend exclusively on their own full time personnel. A few organizations might supplement their work force by volunteers but they are generally released as soon as possible. A common pattern is to bring in personnel from an equivalent organization, e.g. utilities may bring in linesmen from a distance. In restricting themselves to traditional tasks there is no great change in the work performed in disaster from their regular jobs.

Group 2. The "expanding groups" are made up of voluntary groups, such as Red Cross, Salvation Army, and Civil Defence agencies. During pre-disaster times their tasks are not related to their emergency activities. In disaster operations they become active in a different way. To a certain extent they are community rallying points, they are ready to be activated to deal with the anticipated needs in large scale emergencies. When a disaster occurs these pre-emergency groups provide the name and their permanent workers for the core of the new expansion. Transformation takes place. The new group is considerably larger than the older cadre. A large number of persons, not working members of the group in ordinary times, now join the activities of the permanent staff. Many of the day-to-day activities of these groups are temporarily laid aside during time of emergency. While the name is the same, the expanding group has new personnel carrying out these traditional but latent tasks. Changes in social arrangements are not easy under difficult conditions. These groups change both externally and internally in relationship. Some of the traditional patterns of friendship and contact are shifted. In addition they have no training, no common experience in carrying out tasks, and their boundaries are difficult to determine. They operate in the name of an organization without facts to back them. They often go beyond even their latent emergency tasks. A great deal of duplication occurs, e.g. in one disaster the Red Cross, Salvation Army, and the local Civil Defence, were all putting together lists of missing persons. The limits of their responsibility are not clear.

Group 3. The "groups with new functions" are the most difficult to operate because of their broad dictum to help, but they have no specific notion of how to help.

Group 4. The "new ad hoc groups" tend to emerge in two different disaster situations. In both, however, they fill a gap not filled by other organizations.

The first situation where these groups have been observed is, where people are isolated from any established emergency groups which normally become involved in disaster. This could occur in a flood situation. It did happen in a snow storm when 500 people were stranded in a Howard Johnson Restaurant on the Pennsylvania turnpike. They organized themselves and coped with their immediate problems. A very complex type of relationship developed spontaneously operating a total shelter program which disappeared after 24 hours. The second situation is one where there is lack of information about the scope of the disaster or lack of information about control among the various groups involved. This leads to the emergence of groups with the following activities:

a) ones to compile information about what happened, e.g. search and rescue groups very often pop up spontaneously.

b) operational groups usually found near communication outlets. Their function is seemingly to control emergency activity.

c) ones co-ordinating at top policy level such as meetings not dealing with day-to day or minute-to-minute operation but with emergency phenomena which characterize the particular situation.

The problem in disaster operations is that the routine pattern of organization no longer works. One has to deal with an emerging situation including the phenomena of new groups as described in Group 4, undertaking co-ordinating, centralizing information and control-functions. These processes are central to operation. It is possible to institutionalize such process, and certainly a community is better off if it anticipates some of the tasks for emerging groups which are new. Disaster Planners could then build these into their experience and co-ordinate them with the structure. Or in other words, if the co-ordinating centralizing information, and control functions are planned the operation is smoother.

Disasters produce expenditures of human energy by groups, both families and organizations, which infuse a whole system and can bring it to new potentials of productivity, expansion and capacity.▲

MULTIPLE FIRES FROM A NUCLEAR EXPLOSION

by

A. F. B. Stannard
Scientific Adviser
Canada Emergency Measures Organization

When a nuclear weapon is exploded above a city, an area several miles in diameter is almost certain to be virtually demolished by a combination of the explosive forces and heat from the fireball.

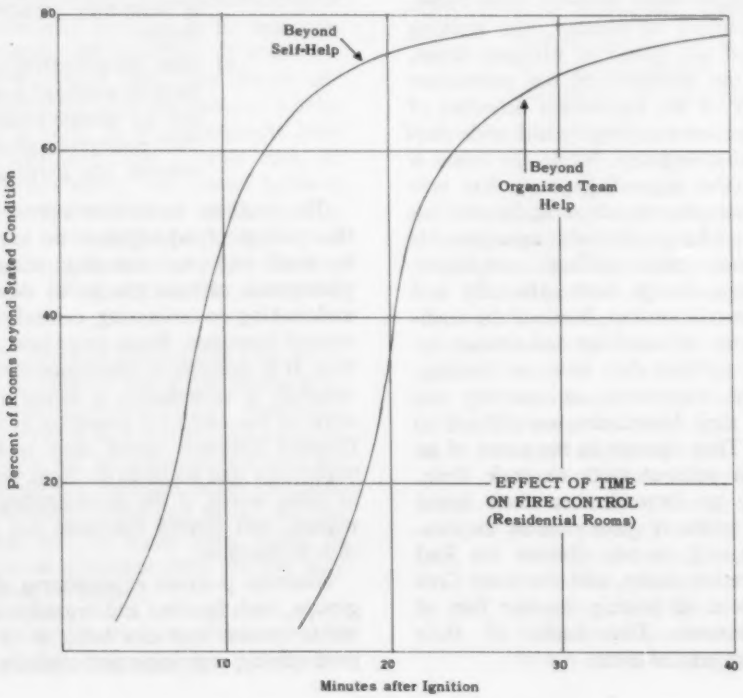
At somewhat greater distances from the centre of the explosion the blast damage to homes will not be enough to make them uninhabitable. This area of minor damage will be much larger than the area of total destruction but unless immediate action is taken to put out thousands of small fires started by the radiant heat of the bomb, the majority of the buildings may burn.

The heat effect of the bomb may be compared to sprinkling several million lighted matches over the whole region. The fires lighted would be in easy burned materials—dry leaves, fodder such as straw and hay, trash piles, window curtains, drapes or furniture close to windows.

Almost all of these fires could be put out if they were attended to within a very few minutes; a pail of water, a bucket of sand or a wet towel could be enough. But the time for action would be very short. How short is illustrated in the diagram. This is taken from an actual study of indoor fires and is considered accurate by our fire authorities. It shows in minutes (on the horizontal scale; how long it takes for a given percentage of fires (vertical scale) to become unmanageable. For example, in 10 minutes 50% of room fires have passed the self-help stage. In 20 minutes this proportion has risen to more than 70%. "Self-help" means a team of two people equipped with hand operated extinguishers. An "organized team" means four men wearing protective clothing and trained in the use of small hose lines with mobile water supplies.

If we ever have to face the hazards of a nuclear attack, householders should take shelter when advised. But once the blast wave has passed they should not wait for fire departments to put out any fires which may have started. There is an urgent need to extinguish all small fires immediately. For ten minutes after the explosion the fire extinguishing odds are in favour of the householder; beyond that time his home and belongings would probably burn.

The diagram is just as true for today's fires as for a nuclear attack. It is a powerful argument for each homeowner having a good fire extinguisher and the knowledge of how to take prompt and effective action. ▲



A NEW SPIRIT IN DISARMAMENT TALKS

Statement by Lieutenant-General E. L. M. Burns,
Canadian Representative on the First Committee,
United Nations General Assembly,
October 26, 1966

A year ago, the Secretary-General of the United Nations pointed out that to halt the spread of nuclear weapons was the most urgent problem confronting this organization. The same view has been expressed by many world leaders in speeches before the United Nations and elsewhere. Spokesmen of my own Government have repeatedly called attention to the grave dangers to peace which could be caused if more countries acquired nuclear weapons.

If this problem was urgent a year ago, it is much more urgent today. In the 12 months which have elapsed since last we debated disarmament in this Committee, several countries have carried out further tests of nuclear weapons. The U.S.A., the U.S.S.R. and France have each conducted several nuclear tests and China, already an important military power, has given further evidence of her determination to develop her military nuclear capability. This makes it plain how important it is to bring all the present nuclear powers into active participation in international disarmament deliberations. With every month that passes, nuclear technology is becoming more widespread, and, with every reactor constructed to generate electric power, more fissile material adaptable for the manufacture of bombs is becoming available. The Canadian Delegation has long urged that action be taken immediately to curb the further spread of nuclear weapons, and to diminish the threat of nuclear war by ensuring that these weapons are restricted to nations now possessing them. Among possible measures, priority should be given to a non-proliferation treaty and to an agreement prohibiting all nuclear tests, whether in the atmosphere or underground.

To the Canadian Delegation, and I think to all of us, it must appear that the prospects for achieving agreement on non-proliferation are more favourable today than they were a year ago. At our meeting on October 20, we heard Mr. Federenko say: "there are no insurmountable difficulties for the solution of this problem". And later: "The Soviet Union is working consistently for the conclusion of an agreement on the non-proliferation of nuclear weapons without delay". Mr. Goldberg quoted what Mr. Gromyko, the Foreign Minister of the U.S.S.R., said after his recent meetings with President Johnson and Secretary Rusk: "Both countries, the United States and the Soviet Union, are striving to reach agreement to facilitate conclusion of an international agreement on this question". And Mr. Goldberg also quoted what President Johnson said on October 13: "We have hopes that we can find some language that will protect the national interests of both countries and permit us to enter into the thing that I think we need most to do, that is, a non-proliferation agreement". I make no apology for repeating these statements, for they show, the Canadian Delegation believes, the increased determination of the U.S.A. and the U.S.S.R. to solve this problem, to come together on suitable terms for the provisions of a non-proliferation treaty. They show—and we have other indications—that there is a new spirit in the negotiations, a realization that the importance of achieving agreement on this sector of the disarmament problem greatly outweighs some of the considerations which have delayed progress heretofore. The Canadian Delegation applauds that determination. We are heartened to learn that a new series of talks has been initiated to work out terms mutually acceptable to the U.S.A. and the U.S.S.R. We welcome the prospect of further meetings between the two major powers which, assisted by the discussions in this Committee and in the ENDC, may result in an agreed text acceptable to all states concerned—the nuclear powers and the states which do not have nuclear weapons alike.

While this year's meetings of the ENDC recorded no spectacular achievements, it is generally conceded that the discussions have been most useful in clarifying the issues that lie before the Committee. This was particularly true of the non-proliferation deliberations. Mr. Goldberg, in his address on October 20, outlined the areas where progress has been made: (1) progress towards understanding that collective nuclear defence arrangements do not and need not lead to proliferation; (2) progress in accepting the need for safeguards on peaceful nuclear activities; (3) progress in understanding the special problem of peaceful nuclear explosions; (4) progress in exploring ways to halt and indeed to reverse, the build-up of nuclear weapons stockpiles and delivery systems. We were encouraged by the generally high level of debate in the ENDC this year, and by the frankness of the exchange and by the helpful and constructive contribution of the non-aligned members of the Committee. In their joint memorandum on non-proliferation, they expressed their concern that an eventual treaty should reflect a balance of obligations and responsibilities as between the nuclear and non-nuclear countries and should lead to wider measures of arms control and general and complete disarma-

ment. I think it fair to say that their point of view has been accepted by the other members of the Eighteen-Nation Committee. While the Canadian Delegation attaches the utmost importance to the early conclusion of a non-proliferation treaty, we regard it as only the first of many measures designed to stem the nuclear-arms race and bring us closer to our objective of general and complete disarmament. We welcome what Mr. Federenko said: "As it works for the non-proliferation of nuclear weapons, the Soviet Government does not in any way strive to consolidate and perpetuate the so-called nuclear monopoly of the nuclear powers. Such an agreement cannot and must not be regarded as an end in itself; it should be regarded only as a step towards the prohibition and destruction of nuclear weapons". And Mr. Goldberg said essentially the same thing.

The Canadian Government stands firmly committed to its long-established policy not to produce nuclear weapons, which has been well within our technical ability for many years. We are also committed to the conclusion of a universal non-proliferation treaty as the most urgent arms-control measure before the international community. There is considerable common ground between the U.S.A. and the U.S.S.R. draft treaties now on the table. We believe they are close enough in object and scope that we can reasonably expect conclusive negotiations on the substance of a treaty. As far as the substance is concerned, we wish to see a formula which would ensure that the nations possessing nuclear weapons—or nuclear powers—be limited to the existing five, and that the control of nuclear weapons not be allowed to pass to other countries. We are satisfied that this can be done without interfering with legitimate defensive arrangements of alliances.

We think it important that a treaty include an effective provision for verifying that obligations undertaken are observed. Article III of the present U.S.A. draft treaty, which would call upon all signatories "to co-operate in facilitating the application of the IAEA or equivalent international safeguards on all their peaceful nuclear activities", would contribute both to the effective working of a non-proliferation treaty and the strengthening of the international safeguards system. If provision were also made for the application of international safeguards on a mandatory basis to all foreign transfers of fissile materials, as is indeed already the policy of the Canadian Government, a safeguards article would itself become an effective obstacle to further proliferation.

While I am on this point, I should like to refer to the following part of a statement made by the representative of Czechoslovakia at our 1432nd meeting: "At the tenth general conference of the IAEA in September of this year in Vienna, the Delegation of Czechoslovakia, together with the Delegations of the Polish People's Republic and the German Democratic Republic, expressed its readiness to accept agency guarantees for its nuclear installations if West Germany and other non-nuclear NATO members act in the same way". I think it would be of interest to members of this Committee to note the response to this proposal which has been made by the Federal Republic of Germany, as set out in a press release of today's date: "The Government of the Federal Republic of Germany has noted with interest proposals by Poland and Czechoslovakia to place their nuclear facilities under the safeguards of IAEA. The German Government appreciates the statements by Poland and Czechoslovakia as a significant step towards putting the use of nuclear energy under international safeguards also in states of Eastern Europe. The proposals by Poland and Czechoslovakia are being considered very seriously by the Government of the Federal Republic of Germany, together with other member states of the European atomic community."

The Canadian Delegation welcomes this evidence of increasing interest and of moves towards the extension of the safeguards of IAEA over various nuclear installations in Europe and elsewhere.

Since it is impossible to distinguish between the technology required for nuclear explosions for military and for peaceful purposes, we consider that the countries not possessing nuclear weapons should give up the right to conduct nuclear explosions for any purpose whatsoever. Such action on their part would, of course, have to be subject to an undertaking to establish a service under international supervision which would make available at a fair cost nuclear explosive services for legitimate civil projects whenever such explosions become technically and economically feasible, and provided they are consistent with test-ban treaty obligations. This would ensure that the benefits of controlled nuclear explosions would be generally available at minimum cost without incurring the drastic political and military consequences of the further national development of nuclear bombs.

We feel that it may be necessary to give security assurances to non-aligned countries over and above the general terms of the UN Charter. In this way, perhaps, any disadvantages of their accession to a non-proliferation treaty could be offset. Whether these assurances are to be provided within the context of a non-proliferation treaty or in some other way will mostly depend on the views of the countries concerned. We should, therefore, be most interested to hear the views of non-aligned members on the merits of the various alternatives which have been proposed, as well as any other ideas which they themselves may advance.

We believe that, as now revised, Draft Resolution A/C. 1/L. 368 on the renunciation of actions hampering the conclusion of the agreement on non-proliferation should contribute to establishing a favourable atmosphere for the negotiations which will be taking place here, in Geneva, and elsewhere and help expedite them. It was for this reason we decided to associate ourselves with the resolution as a co-sponsor.

While Canada is committed to a universal non-proliferation treaty, we by no means rule out the regional approach to non-proliferation. We therefore support, and should like to encourage, countries attempting to create nuclear-free zones in areas relatively free from grave international tensions. The efforts of the Latin American and Caribbean countries in this regard deserve particular praise, and we would also wish African countries success in their aspirations to make their continent a de-nuclearized zone.

Most countries, including the U.S.A. and the U.S.S.R., advocate an end to nuclear testing undergound to complete the agreement which was reached in Moscow to prohibit nuclear testing in the atmosphere, outer space and under water. The difficulty, of course, is over verifying that all parties to the treaty shall respect obligations not to carry out underground tests. The position of the U.S.S.R. is that all underground tests anywhere can be detected by national means within national territories. The position of the U.S.A. and its Western allies is that, although considerable improvements have been made in detecting underground tests by seismological and other scientific means, yet a certain number of underground events still cannot be identified as either earthquakes or nuclear explosions. That is to say that if verification of a treaty were limited to seismological means alone, there would still be a possibility of a nation evading its obligations by carrying out clandestine underground tests. The U.S.A. position is that a small number of inspections at sites of unidentified events is necessary in order to be sure that obligations would be adhered to.

As I have indicated, there has been continuing effort to improve techniques for detecting and identifying of underground events. Possibilities of supplementing them are being explored. Canada supports the proposal put forward for this purpose by Sweden, which is that interested countries, primarily those not nuclear powers, should exchange seismic information. The proposed exchanges would take place principally among those countries with a sufficiently advanced seismological science and data-gathering or processing equipment, but results would be available to all. With information coming from many sources, individual countries would be in a better position to assess whether any suspicious underground event was natural or nuclear in origin. We attach importance to the participation of the nuclear powers in the suggested exchange and welcome their expressed interest. If the U.S.A. and the U.S.S.R., for example, could provide information from sites close to indeterminate events to supplement information now available from distant monitoring, many more nuclear events could be identified.

It has also been suggested recently that the idea of so-called "black boxes", that is, sealed seismographic installations, could supplement distant means, and would make it almost certain that no clandestine testing could be carried out. We would hope that the U.S.S.R. will also agree to co-operate in examining such procedures which, in combination with others, might make it possible to break the deadlock in the underground test prohibition problem, and permit the successful culmination of the efforts which have been under way since the Moscow Treaty was signed. We have also studied with much interest other proposals made by Sweden, Mexico, Brazil and the U.A.R. in an effort to bridge the gap between the positions of the two major powers on this issue. We hope these suggestions will be carefully considered by those principally concerned.

Another proposal which, though not new, commends itself to Canada is to halt the production of fissile material for military purposes, popularly known as the "cut-off". Several nations besides the U.S.A. (which has elaborated proposals in this regard) appreciate that a verified halt in the production of fissile material for use in weapons would reverse the dangerous continual increase in the nuclear potential of nuclear powers. It would be, therefore, an anti-proliferatory measure mainly affecting nuclear powers, and would constitute a "balancing obligation" to the obligations nations without nuclear weapons would incur by signing a non-proliferation treaty. In our view, the cessation of fissile-material production should be seriously studied. It combines the quality of not endangering existing national security with the positive values to which I have just referred.

This brings me to the question of general and complete disarmament, which has not occupied very much of the time of the Eighteen-Nation Committee in this year's discussions, although it was not neglected entirely in the ENDC. We have always recognized that a disarmed and peaceful world is our final goal. But the same difficulties have always faced us when discussions of the U.S.A. and U.S.S.R. draft treaties have been undertaken. I think most of those in this Committee who have studied the matter at all know the positions of the two sides. It has been clear for a long time that the crux of the problem lies in the opposed conceptions of how nuclear armaments are to be reduced and then eliminated. It is also clear that little progress can be expected on this central problem until greater mutual confidence exists, so that the nations concerned can feel any nuclear-weapons reduction would not imperil the balance of our present security arrangements. It seems to the Canadian Delegation that we must look for some new, more hopeful means of initiating a process which will lead eventually, through increasing confidence on both sides, to general and complete disarmament. We favour the step-by-step approach because it seems illusory to think that significant disarmament advances will be made in any other way. The Canadian Delegation feels that a non-proliferation treaty, an underground test ban, the cut-off of production of fissile material for nuclear weapons and the reconversion of existing nuclear weapons and explosive material for peaceful uses would be important initial

Continued on page 22

NUCLEAR ATTACK: THE ECONOMIC CHALLENGE AND RESPONSE

This paper was prepared by the Economic Planning Division, Canada Emergency Measures Organization, in May 1966.

General

Every day in the peacetime economy, millions of economic decisions are made. While seemingly separate these decisions are either inter-related with each other or with past or future decisions. A household, for example, can determine how much of its budget it can allocate for meat purchases, because it knows approximately its other food costs and its costs of items such as shelter, clothing and annual vacation. Similarly decisions by industry can be made on the basis of approximate costs and selling prices. These millions of decisions are tied together by the existence of a relatively stable structure of prices and monetary arrangements.

In addition, the economy on a physical basis is becoming more complex and the production of a certain commodity may depend upon raw materials, or other inputs from many sources, some of which may be thousands of miles away in Canada or elsewhere. Markets likewise may be located away from where the commodity was produced. Thus the transportation, communication and power supply systems, as well as the plants and factories and skilled manpower, are important factors in the functioning of the economy.

Economic Effects

A nuclear attack on Canada would produce widespread effects on its economy both in the short term and in the longer term. The short-term effects would consist of the loss of production. This loss of production would occur through physical destruction, disruption of power, transportation or communication systems, denial of access to production facilities because of fallout, death or dispersal of employees and other causes. At the same time considerable economic resources—men, material and equipment—would be employed in survival operations, in providing emergency health and emergency welfare services and in other tasks such as fire fighting, transportation of urgently needed supplies and personnel, and in assessing the effects of the attack. These represent uses of economic resources not encountered in peacetime.

Arrangements for survival and emergency operations have been made through the co-operative efforts of the federal, provincial and municipal governments.

Survival by itself however would not be enough; capacity for rehabilitation and recovery and for contributing to the successful prosecution of the war would be essential. During the immediate post-attack phase, a significant amount of economic activity would probably continue in undamaged areas which were either uncontaminated or lightly contaminated. Such areas would, of course, very rapidly feel the economic repercussions of destruction or immobilization elsewhere. In spite of the difficulties, every effort would be made to keep the economy going during this phase, so as to begin providing the basis for national recovery.

The longer term effects on the economy would be more complex and reconstruction of the economy would represent a major task requiring the efforts of government, industry and private citizens.

Blast and fire would cause casualties to the population, the destruction of resources such as factories and utilities, and the destruction of key parts of the services which are necessary for the running of the economy. The repercussions of this destruction would spread. For example, the loss of key facilities for transportation, communications and power supply would have far-reaching effects throughout the systems concerned. The destruction of industrial plants in one place would affect the operation of plants elsewhere which depended on them for components. The destruction of large cities could result in the loss of concentrations of skills and specialized equipment needed throughout the economy.

The spread of fallout would have longer term as well as immediate effects. If fallout immobilized an area because people were under cover, production would cease for a period of time. There would be some direct loss of stocks of materials or of agricultural products through contamination. Other stocks and production capacity would be rendered inaccessible until fallout decayed. The economic effects of fallout would spread beyond the contaminated areas to places dependent on them for supplies. In addition, transportation, communications and power supply networks passing through a contaminated area might be disrupted.

In winter, the general situation would be aggravated. Bad weather might hamper transportation and communications, and make it more difficult to repair damaged systems, such as those for communications or the transmission and distribution of electric power and natural gas. The cold would in any case increase the consumption of scarce fuel by all users, and greatly increase the problem of providing accommodation for the homeless.

Similarly, there would be major effects on the financial basis of the economy. These would arise partly from the physical destruction of the financial records and currency held by banks and commercial institutions and partly from pressures which might develop

owing to real or expected shortages of commodities. Destruction of factories and plants, or shutting them down for lack of key components, power or transportation would have a serious impact on employment and upon earnings. Paying for government activities would also present problems.

Adjustment in the face of these changes would therefore have to be as immediate as possible. It would call for rapid action, under conditions where the consequences of wrong decisions could be serious.

Effects on Specific Sectors of the Economy

The effect of a nuclear attack can be more easily appreciated in terms of the probable effects on specific sectors of the economy. While the immediate action is likely to take place on a sector basis, it is important that the various actions taken be consistent with each other. The likely effects on some sectors of the economy are outlined below.

Supply

There would be an immediate need for essential items, such as food, including special foods for infants; fuel, particularly for heating and transportation purposes; essential items for personal use, especially clothing, shoes and blankets; repair materials and equipment for restoring such essential things as railways, public utilities, housing, communications facilities, and roads; and medical supplies.

Many of these vitally needed supplies could become scarce immediately after a nuclear attack for a variety of reasons. Some would be destroyed. The normal commercial distribution system could be dislocated by the dispersal of people or by the physical disruption of transportation and communications. Areas normally supporting only a small number of people might suddenly be inundated by evacuees. There would be some tendency for people to buy all available supplies and hoard them. Imports might cease altogether, or at least be seriously curtailed.

The essential survival needs of the population during the first few weeks after a nuclear attack would probably have to be met, in the main, from surviving stocks of ready-to-use finished products rather than from the normal productive capacity of the country. A certain amount of salvaging would be undertaken. Most manufacturing, which tends to be concentrated in or near the large cities, could drop to a very low level or cease for a time. Production in areas not directly affected or threatened by attack would be severely hampered before long for lack of materials or spare parts, or because of the widespread disruption of transportation, communications, and financial arrangements. The difficulties of supplying the population with the basic necessities of life after a nuclear attack would likely be further complicated by the presence of radioactive fallout.

Agriculture would be likely to suffer less destruction under nuclear attack than the manufacturing industries and would probably continue in many areas, but contamination by fallout could seriously affect land, crops and livestock. Farmers would need expert advice and assistance in dealing with the fallout problem, and measures might have to be taken to expand agricultural production rapidly in areas free from contamination. The continuation of agricultural production on an adequate scale would depend on the supply of key items such as seed, fertilizer, pesticides, gasoline and spare parts for machines.

The fisheries would also be likely to suffer less destruction than manufacturing, but operations might be hampered by fallout. Continued operations would be dependent on arrangements for the resupply of essential commodities, such as gasoline and fuel oil, ice, salt, packages and containers and power for plants.

Transportation

Success in meeting the problems of supply would depend on the availability of transportation, which could be scarce, especially during the shock phase. At the same time, the ability of trucks, railways, ships and aircraft to maintain service would depend on the continued supply of fuel and other key items. The extent to which transportation services might be disrupted by blast, fire and fallout, cannot be predicted with any certainty, but some areas might be cut off for a time. Traffic congestion and shortage of employees could reduce the efficiency of major systems.

Different forms of transport are vulnerable to varying extents. The road transport industry has considerable flexibility and its facilities are widely dispersed. Because of this, it would have a major role to play during the shock phase.

The effects of attack could be much more severe on the railways. The main lines pass through the areas most likely to be attacked. Rolling stock, major repair facilities and marshalling yards tend to be concentrated in these areas. If track is destroyed, alternative routes are harder to provide than in the case of roads.

Inland water transport could be used during the inland navigation season, and coastal shipping would be available at all times of the year. Any damage which occurred to locks, canals and other narrow waterways would reduce the usefulness of shipping. The availability of harbour facilities would be a critical factor.

Aircraft might be used for the movement of key personnel and the delivery of urgently needed items.

Communications

Communications of all types play an essential part in the working of the economy and would assume an even greater importance following an attack. The usefulness of the telephone and telegraph for the conduct of business does not need any emphasis. The radio and television networks, by spreading information, help to provide the background of knowledge against which economic activity goes on. Maintenance of the tele-

communications network would be essential to the effective rehabilitation of the economy after a nuclear attack.

Other forms of communications are also essential to the economy. Postal services, for instance, play a very significant part in keeping the nation's economy going. Newspapers provide a significant amount of information which people will require in time of national crisis. These activities would have to be kept going wherever possible.

Accommodation

Accommodation for people, industry and government would be in short supply after an attack. The most pressing probem would be to provide emergency lodging for the homeless. This would have to be done locally by making the best possible use of whatever accommodation was available.

Once the shock phase was over, the population would need to be rehoused on a more permanent basis. The scope of this problem would depend largely on the extent to which the population survived. It would be necessary to decide which houses should be repaired and it might be necessary to improvise housing from other types of existing accommodation. A long-term programme for the construction of dwellings and other types of accommodation would form a basic part of the recovery plan. This might involve permanent relocation of people and even the building of new communities.

Finance

Keeping the monetary system in operation would present difficulties, as a result of the disorganization of existing financial relationships and of the machinery of finance. The supply of currency itself might be scarce in some areas so that people might have to improvise credit arrangements for a while. Many banks might be destroyed or otherwise unable to function. There would be difficulty in transacting business through out-of-town bank accounts because of uncertainty about damage to banks and their assets elsewhere.

The payment of salaries and other contractual obligations might be physically impossible for a time in some parts of the country and many types of economic activity might therefore stop. Many people would be left without money because they were physically separated from their financial resources. Emergency methods of dealing with these matters would have to be adopted.

Governments at all levels would need funds to meet their current expenditures. The collection of taxes could be extremely difficult, particularly during the immediate post-attack period, and there would be no revenue from damaged areas. However, measures are being planned to cope with such problems.

Despite the difficulties involved, it would be desirable to keep the economy on a monetary basis as far as possible; to try to ration everything would be too ponderous and unworkable. To do this, some special financial procedures might be needed, such as a moratorium on certain debt payments. Among other measures, strict control of prices, rents, wages and salaries would have to be introduced as soon as possible so as to prevent inflation and to treat everyone fairly. It would be necessary for welfare services to provide lodging and other essential services to people rendered destitute or temporarily in need due to economic as well as other causes.

Manpower

A thermonuclear attack would kill or disable many people possessing valuable and irreplaceable skills and drastically change the composition of the labour force in respect of its size, age distribution, location and available skills. It is impossible to estimate such changes accurately beforehand, but clearly they would be of fundamental significance for all types of economic activity.

An adequate supply of manpower to carry out essential economic activity would be a determining factor in our ability to survive a nuclear attack. There would be urgent jobs to be done in the shock phase, and people would have to be found to do them immediately. At the same time, many existing occupations would become important to the extent of being considered critical to national recovery. A major effort would be required after an attack to identify and locate people with specific skills and to match the available skills with the jobs to be done.

Conclusions

To cope with the economic problems encountered after a nuclear attack would require immediate decisions and action by all levels of government. In addition, decision makers in the private sector of the economy would have to adapt quickly to new conditions.

Reliance could not be placed solely on the price system since supply and demand conditions would be radically altered. Vital gaps would appear in the economy through physical destruction and these would have repercussions even on areas which were free from weapon effects. Past decisions would offer little guide under such circumstances, and the future would be clouded with uncertainty. A major task of rehabilitation would be required to make the economy viable under post-attack conditions. While the task of rehabilitation would be formidable, there are many individual aspects where the likely problems can be foreseen and where remedial measures can be planned in advance.

Decisions both in government and in industry would require staff with prior training for the types of situation likely to be encountered. It is necessary to have plans ready in peacetime to provide the necessary legislative authority for the decisions to be made by

Continued on page 22

SOME PUBLIC VIEWS ON CIVIL DEFENSE PROGRAMS

Editor's Note: The following abstracts are excerpted from a 105-page report prepared for the Office of Civil Defence, Office of the Secretary of the Army, Catalogue OS-63-48, dated December, 1964. The report has been reviewed by OCD and approved for publication. Approval does not signify that the contents necessarily reflect the views and policies of OCD. The document was prepared by Jiri Nehnevajsa, Department of Sociology, University of Pittsburgh, Dorothy V. Brodie, Donna Krochmal, and Richard H. Pomeroy.

Introduction

These four reports are based on a survey of Civil Defence and Cold War Attitudes conducted in mid-1963 under a contract between the University of Pittsburgh and the Office of the Secretary of the Army, OCD-OS-63-48. Interviews were conducted with a national probability sample of 1,434 Americans. The field work and sample design were done by the National Opinion Research Centre (NORC) of the University of Chicago.

Each report takes as a topic a key aspect of the sample's orientation to civil defense systems and cold war issues and analyzes it in terms of relevant social and personal characteristics. Interview schedules were administered in the summer of 1963 and dealt with the likelihood and desirability of various alternative shelter systems and cold war outcomes. In addition to the data collected on attitudes and opinions on the central issues respondents were asked a series of questions specifying pertinent elements of their social and personal attributes. These dealt with such topics as marital status, family income, education, age, etc., and a variety of other questions tapping these dimensions.

These reports have been prepared by the Director and staff of the Research Office of the Department of Sociology of the University of Pittsburgh. Abstracts of the reports follow this introduction.

Cost of Civil Defense: A Study of Public Views

by

Jiri Nehnevajsa

This report is based on the responses of 1,434 Americans in a national probability sample to a series of items concerning their perception of the cost of American's civil defence programs and their estimates of how much the United States ought to be spending. The preferred level of annual spending is found to be substantially higher than the estimated current level of spending. This holds for all population categories considered. Further, this estimated level of expenditure is much higher than the actual civil defense spending for current programs. The public believes that national civil defense spending has been much larger than, in fact, it has been. Generally, the public seems to feel that more should be spent. It appears that the public is more receptive to civil defense expenditures when they are phrased in terms of per capita spending rather than total annual cost.

Level of Preparedness

by

Dorothy V. Brodie

A national probability sample of 1,434 Americans was queried concerning its level of civil defence preparedness. This report is based on analysis of responses to two key questions. The respondents were asked if they and their families had a fallout shelter which they had set up themselves. Those respondents who had no shelter were then asked if they were protected in any way and how they were protected in case of nuclear attack. This essentially provides two different levels of preparedness, real (for those who have shelters) and perceived (for those who have no shelters but feel protected for a variety of reasons).

The figure of 2.2. percent of the sample as shelter owners is comparable to reported findings of other studies in this area. The small size of the shelter owner sub-group in the analysis limits the conclusions that can be drawn from a comparison of them with non-shelter owners. Generally, however, those respondents in our sample who were shelter owners tended to be young, to own their own home, rather well educated, high income and high status, resident in the Northeast and Republican in political preference. About a quarter of the sample 24.9 percent, felt that they had some protection even though they weren't shelter owners. These people have many characteristics in common with shelter owners. Generally speaking they are a little younger than shelter owners and of somewhat lower status, although their status characteristics still rank objectively rather high. Their perceived protection comes from an impromptu shelter in the home, or a community shelter. Those relying on community shelters were generally lower in status than those relying on impromptu home shelters.

Marking and Stocking Program

by

Donna Krochmal

Respondents in a national probability survey of 1,434 Americans were asked to describe the present Civil Defense program in their respective communities in terms of the surveying, marking and stocking of available shelter spaces. They were also asked how likely it was that shelter spaces are marked and stocked with everything necessary for survival as well

as how desirable this might be. They were then asked how desirable they thought this was for their neighbors and the President.

Ninety percent of the sample felt it desirable that shelter spaces be marked and stocked while three fourths of them thought it certain or likely that this would actually happen. Similarly, ninety percent felt that their neighbors also found this program desirable and over ninety percent thought the President was favorable. However, a little more than half the sample claimed that they knew of nothing that has been done for Civil Defense in their communities. Generally, these results seem to be pretty homogeneous, with no major population sub-group differences. To some extent respondents of higher socio-economic status were more informed about the program than those of lower status. Both socio-economic groups manifested similar likelihood patterns but the lower status groups found the marking and stocking program more desirable than the higher status groupings.

Information Level

by

Richard H. Pomeroy

This report is based on the mid-1963 survey of Civil Defense and Cold War Attitudes. It examines the overall information level of a national probability sample of 1,434 Americans on the topics of nuclear war and fallout shelters. Respondents were asked to recall any movies, television programs, or reading material they may have encountered that dealt with nuclear war or fallout shelters. Over two thirds of the sample reported exposure to information on these topics. These "exposed" respondents tend to be young, well educated, high income, have a number of young children and work at a relatively high-status occupation. They are likely to live in urban and suburban rather than rural areas and the male head of household usually had military service. The most frequently reported source of information was from articles, pamphlets, etc., with 67.2 percent of the sample being able to recall one or more of these. A total of 54.0 percent recalled a movie or TV program. Very few had read any "books" on these topics and the books mentioned were usually popular novels. In large part the "information" communicated by movies and television was essentially non-technical, usually consisting of a science fiction production rather than a factual report. Although the content of the information respondents were able to recall was usually some form or another of "entertainment", this was not always the case. Of those respondents actually replying to the items from the questionnaire, some sixteen percent recalled exposure to Civil Defense sponsored literature and another 6.9 percent mentioned other government agencies as sources of information on nuclear war and fallout shelters. Thus, over a fifth of the sample, 22.9 percent, were able to recall reading of material sponsored by either the Office of Civil Defence or by some other government agency.▲

Continued from page 17

steps which could be followed by others and lead us towards the general disarmament which we have all declared as our goal. These ideas are some of the important, but by no means the only, measures which should be given serious study here and elsewhere, in order that the impetus of the hopeful agreements of 1963 can be regained, so that we may move forward to more far-reaching stages of general and complete disarmament itself.

This completes the statement of the Canadian Delegation in the general discussion of disarmament. We have only touched on certain of the subjects on our agenda. We reserve the right to speak again when we have reached the stage of considering specific resolutions. ▲

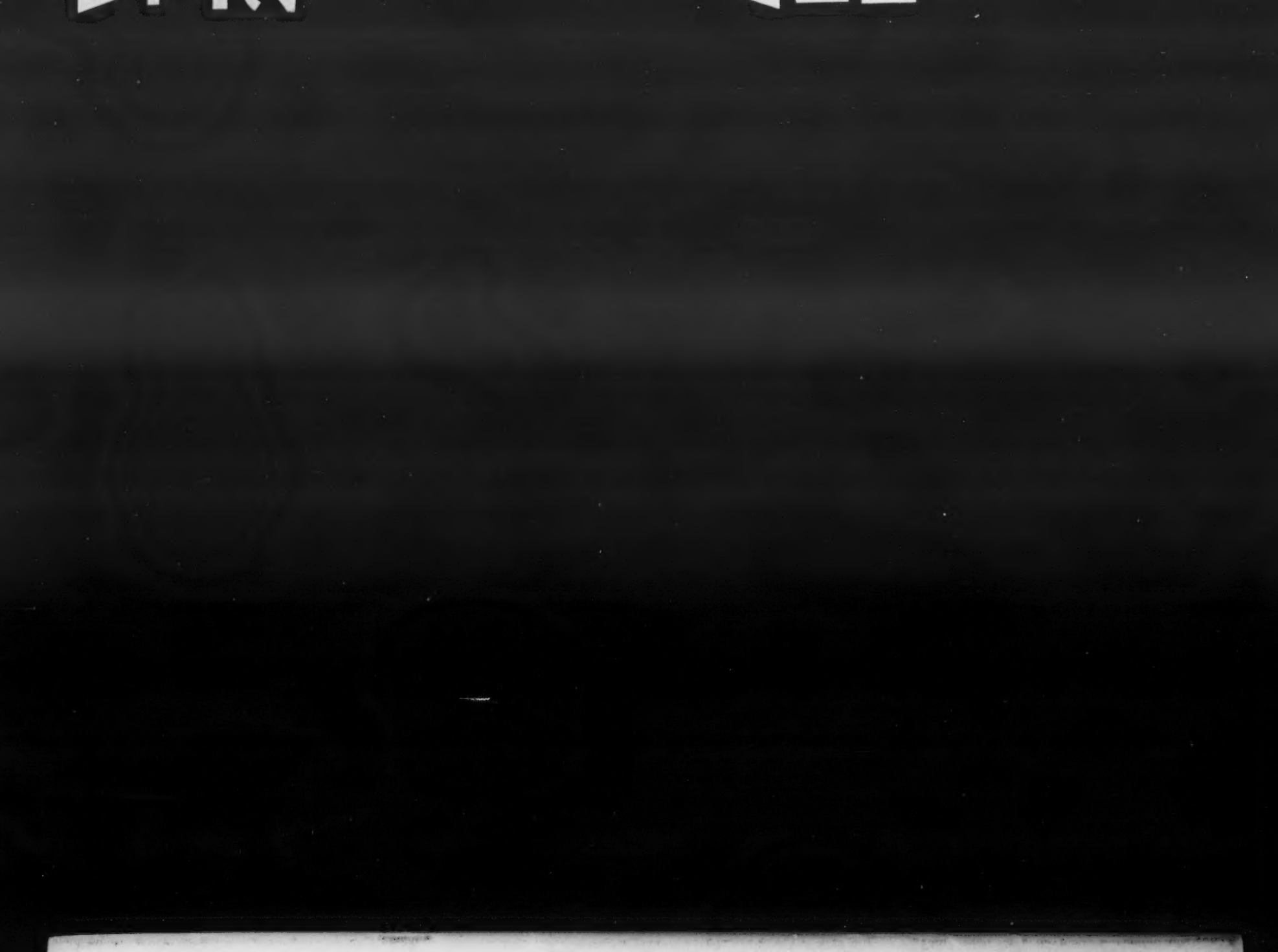
Continued from page 20

governments after a nuclear attack. Government and industrial plans also have to be ready in peacetime, to provide guidelines to those responsible for economic decisions.

It is not possible, of course, to foresee and plan for every event which would arise as a result of a nuclear attack. However, considerable effort has been made by governments and their agencies and by private business in planning for such an emergency. The Government of Canada, for example, through its Civil Emergency Measures Planning Order has assigned specific planning functions to federal departments.

Government plans provide for a considerable delegation of authority to those in close contact with the operations of the economy. For instance, the plans of the Government of Canada envisage the delegation of authority to senior federal officials in the regions and further delegation to local officers. When cut off from their superiors, federal officials would have sufficient legal power to carry out any necessary action. As the country recovered and the economy was restored to working order as an integrated whole, economic activities would be increasingly co-ordinated on a national basis. ▲

If undelivered return to:

The Queen's Printer, Ottawa, Canada

CANADA
POSTAGE PAID
PORT PAYÉ